

Armed Forces College of Medicine

AFCM



Blood Supply of the Spinal Cord

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INTENDED LEARNING OBJECTIVES (ILOs)

By the end of this lecture the student will be able to:

1. **Describe beginning, termination, parts, branches and distribution of the vertebral artery.**
2. **Describe beginning, termination, parts, branches and distribution of the basilar artery.**
3. **Describe the various sources of the arterial supply of the spinal cord as regards their origin, distribution and effect of obstruction.**

Lecture Plan



1. **Part 1 (20 min) Vertebro-basilar arterial system**
2. **Part 2 (25 min) Blood supply of the spinal cord**
3. **Part 3 (5 min) Summary**

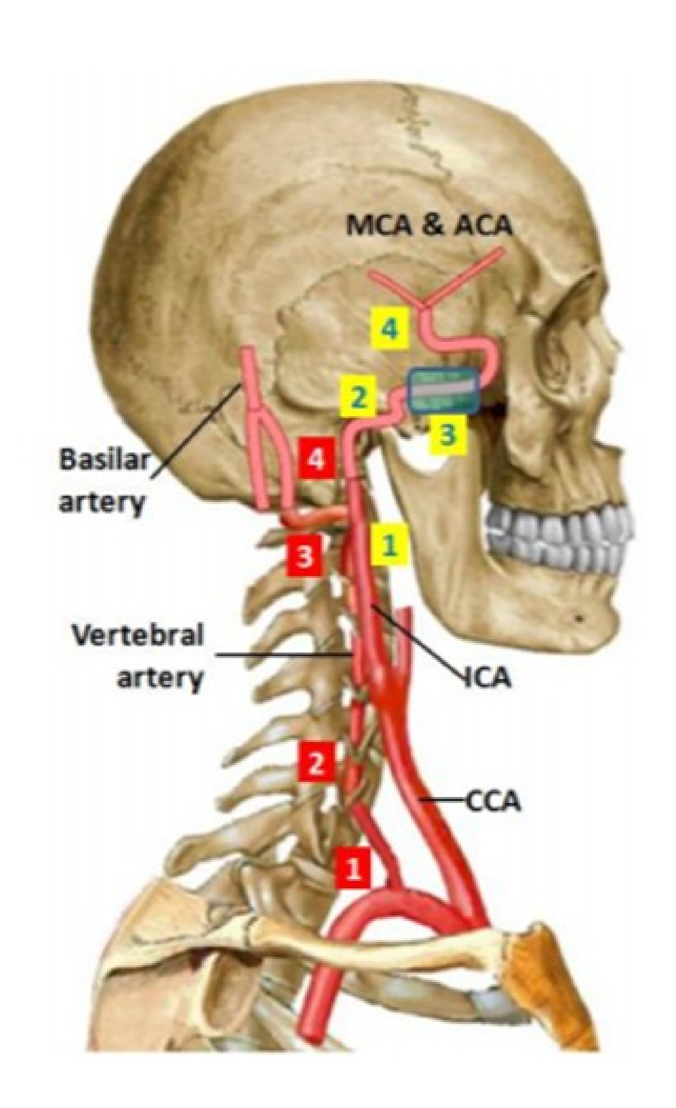
Key Points



1. **The vertebral artery: beginning, termination, parts, branches and distribution.**
2. **The basilar artery: beginning, termination, parts, branches and distribution.**
3. **The various sources of the arterial supply of the spinal cord: origin, distribution and effect of obstruction.**

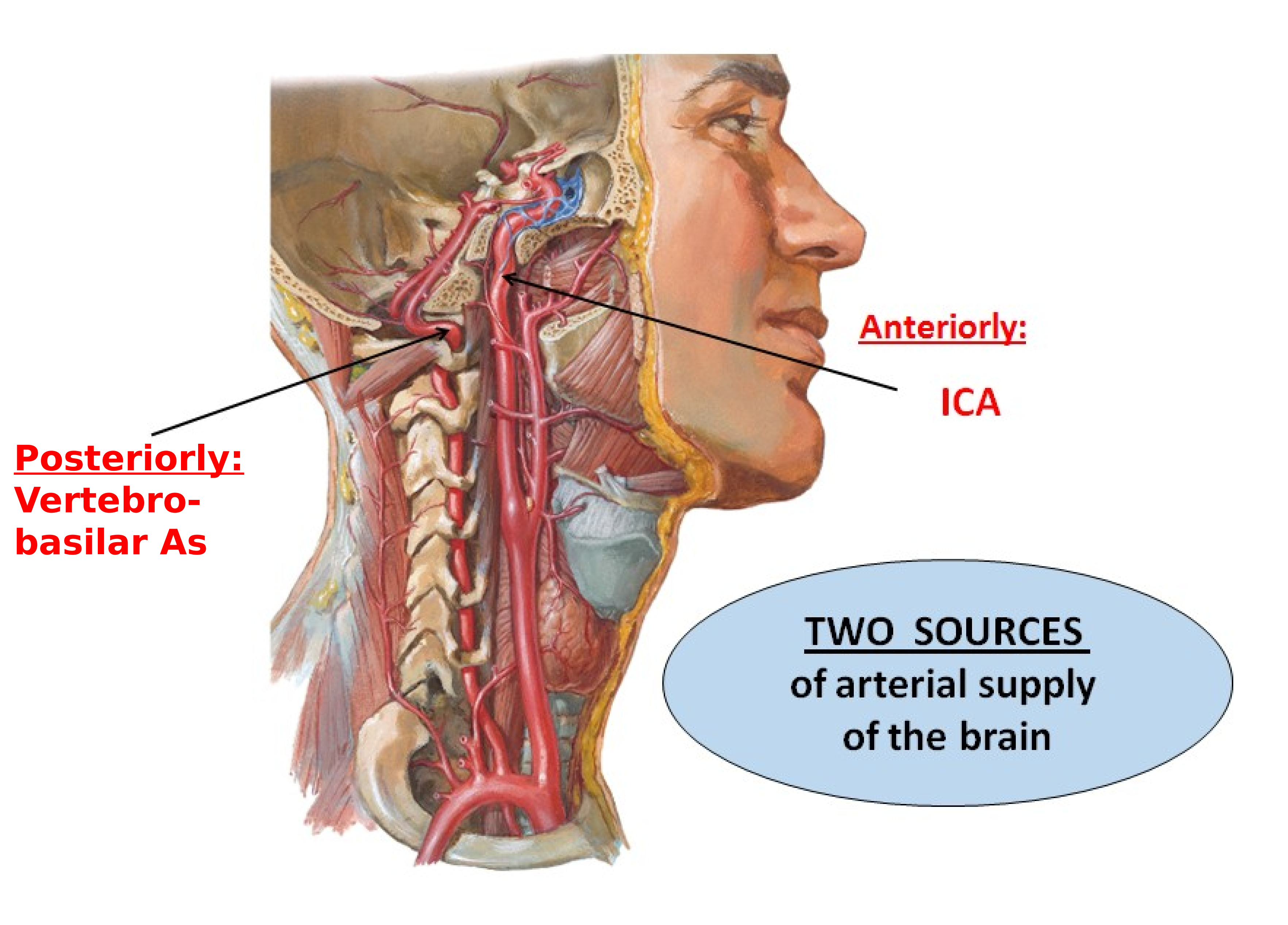
Blood Supply of the Brain

- **The brain is supplied by 2 arterial systems:**
  - **Carotid (2 internal carotid arteries)**
  - **Vertebro-basilar (2 vertebral arteries)**





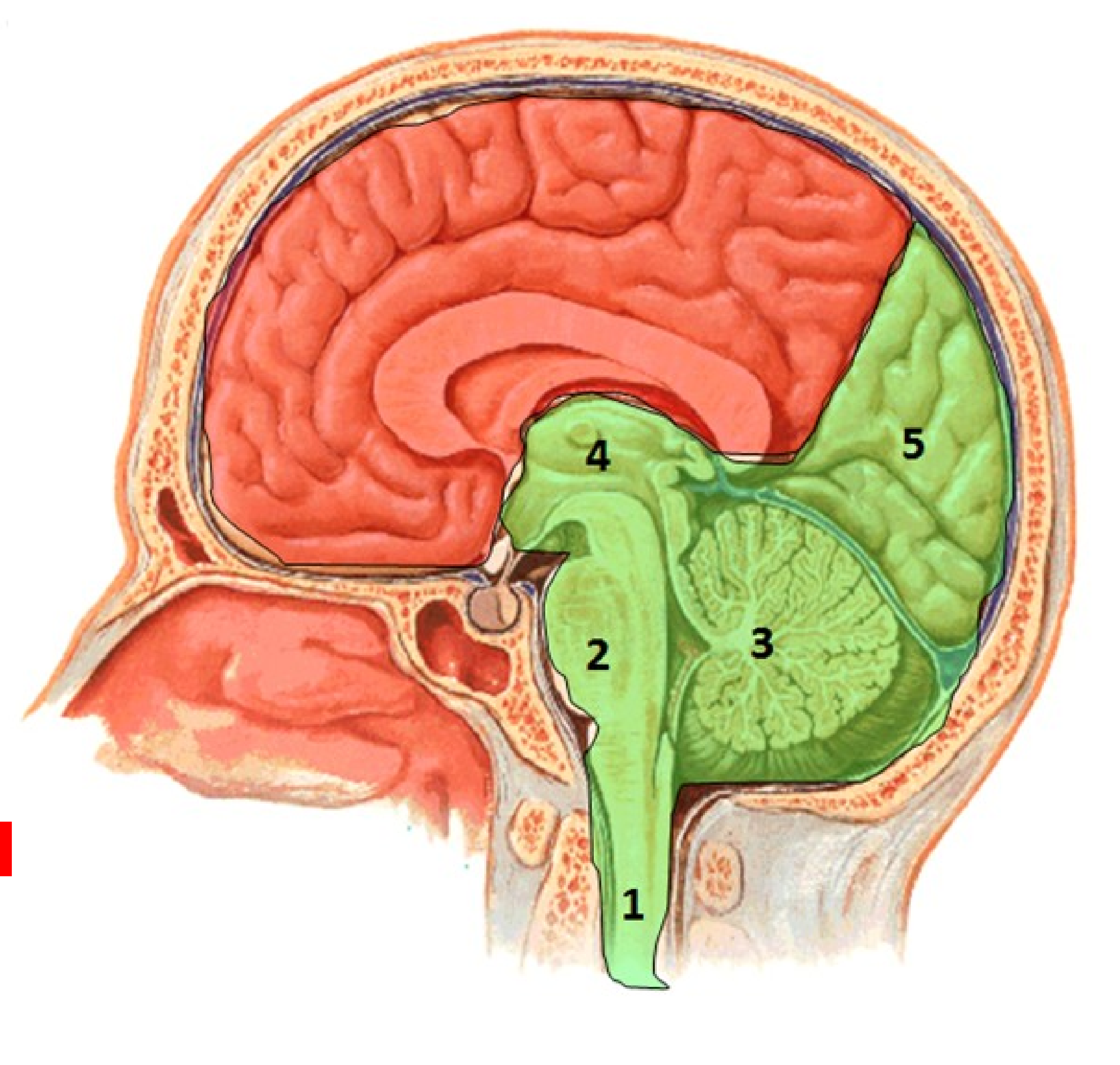
- **Both**


Anteriorly:
ICA
Posteriorly:
Vertebro-
basilar As
TWO SOURCES
of arterial supply
of the brain

- **The vertebro-basilar system supplies:**

1. **Spinal cord**
2. **Brain stem**
3. **Cerebellum**
4. **Diencephalon**
5. **Occipital lobe**

- **Internal carotid artery supplies the cerebrum except the occipital lobe.**



Vertebral Artery

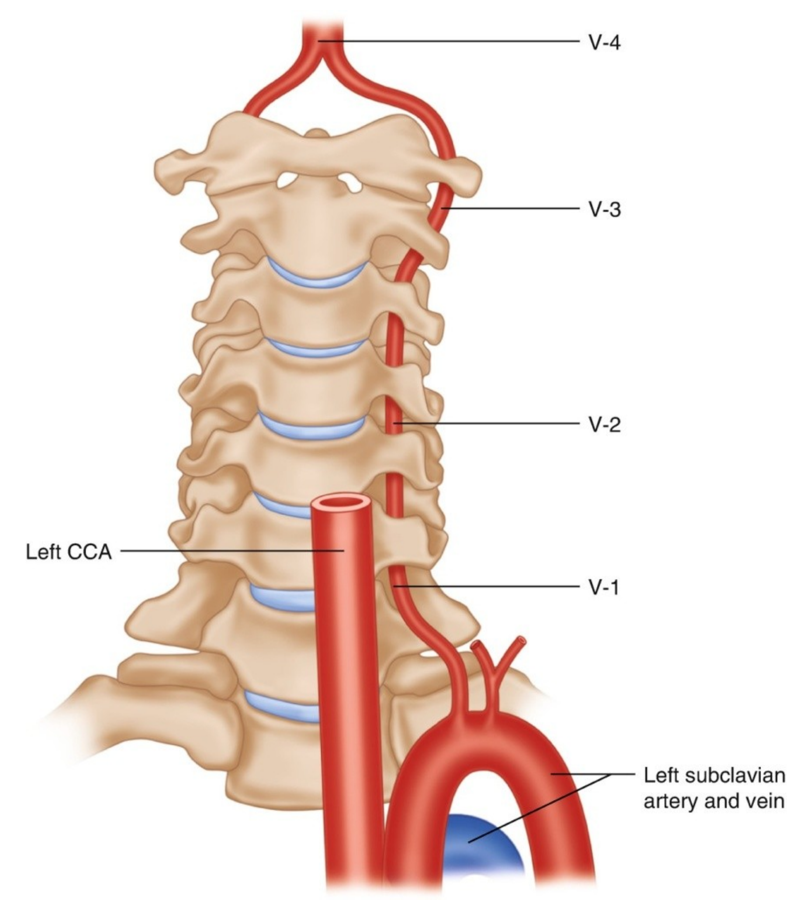
- **Begins as branch of first part of subclavian artery.**
- **Its course is divided into 4 parts:**

➢ **The 1st part before the foramen transversarium of C6.**

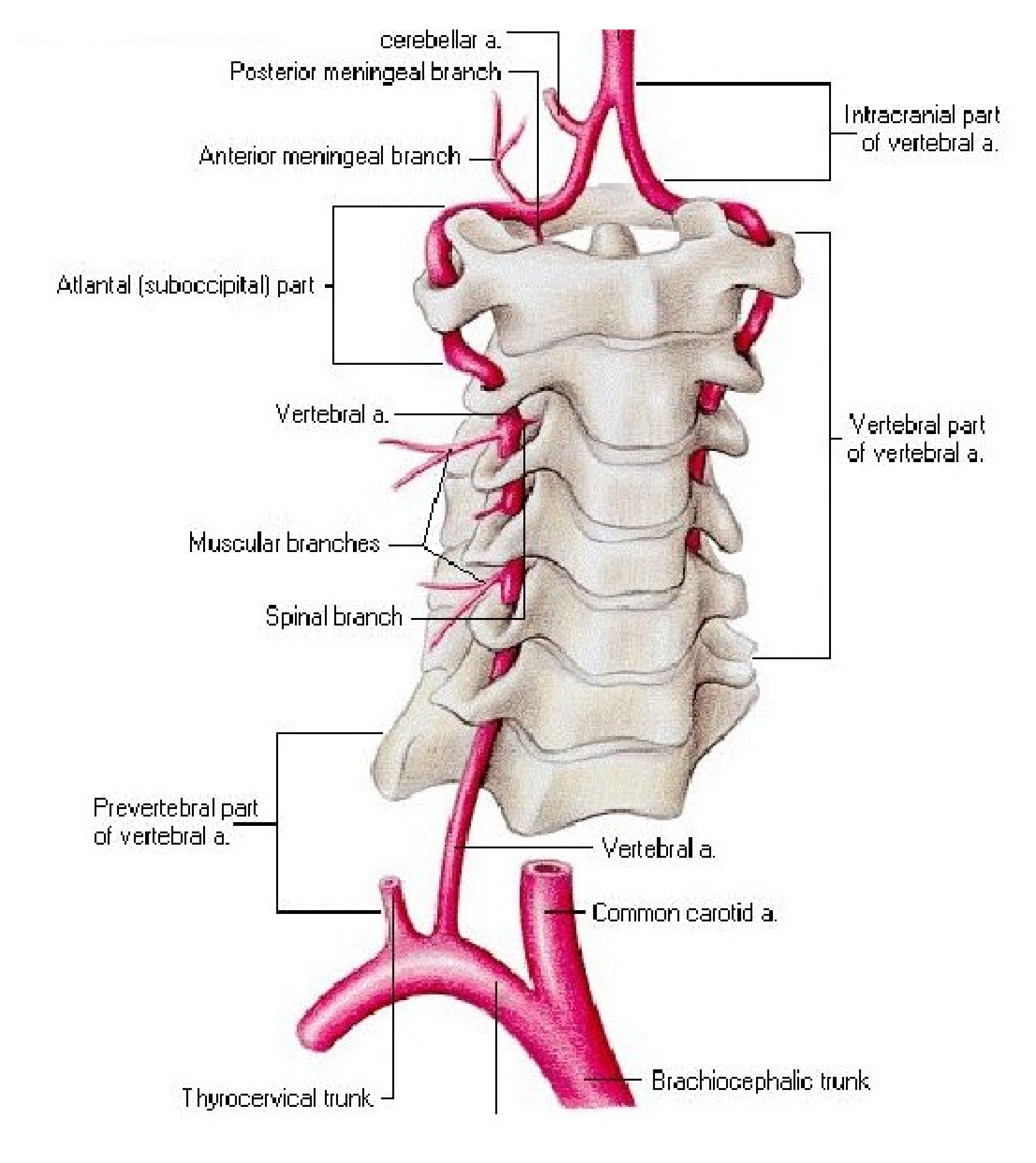
➢ **The 2nd part passes through the foramina transversaria of upper six cervical vertebrae.**

➢ **The 3rd part passes in the suboccipital triangle then enters cranial cavity through foramen magnum.**

➢ **The 4th part passes on ventral surface of medulla oblongata.**



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https://www.researchgate.net/profile/Katharina-Dherde/publication/7222653/figure/fig1/AS:277688590848004@1443217527156/The-course-of-the-vertebral-artery-92_Q640.jpg

Vertebral Artery

- **Ends** **at the** **lower border of pons** **by joining the other vertebral to form** **basilar artery.**
- **Branches of vertebral artery in cranial cavity:**

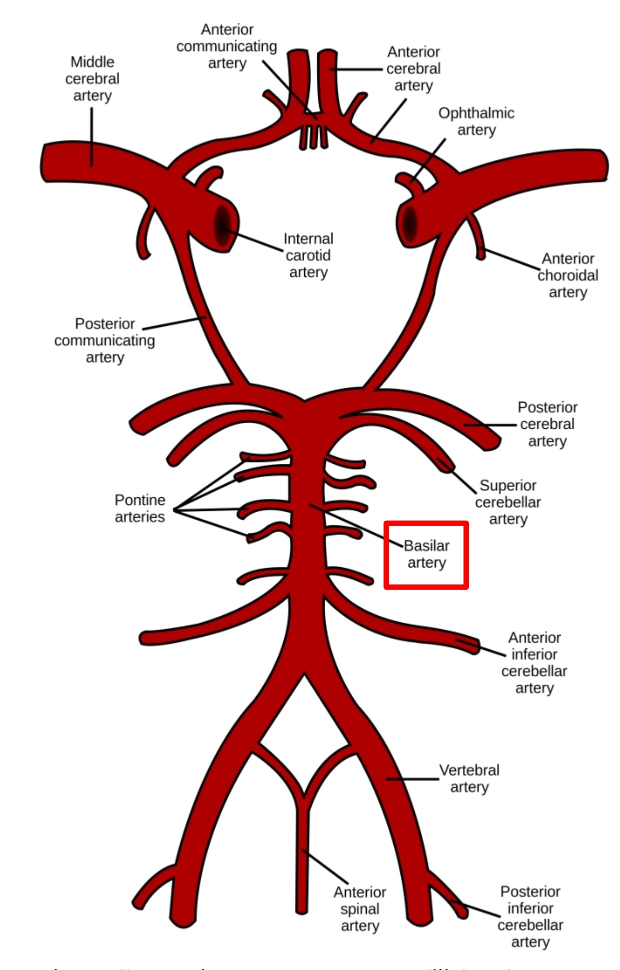
1.Meningeal.

2.Posterior inferior cerebellar.

3.Posterior spinal.

4.Anterior spinal.

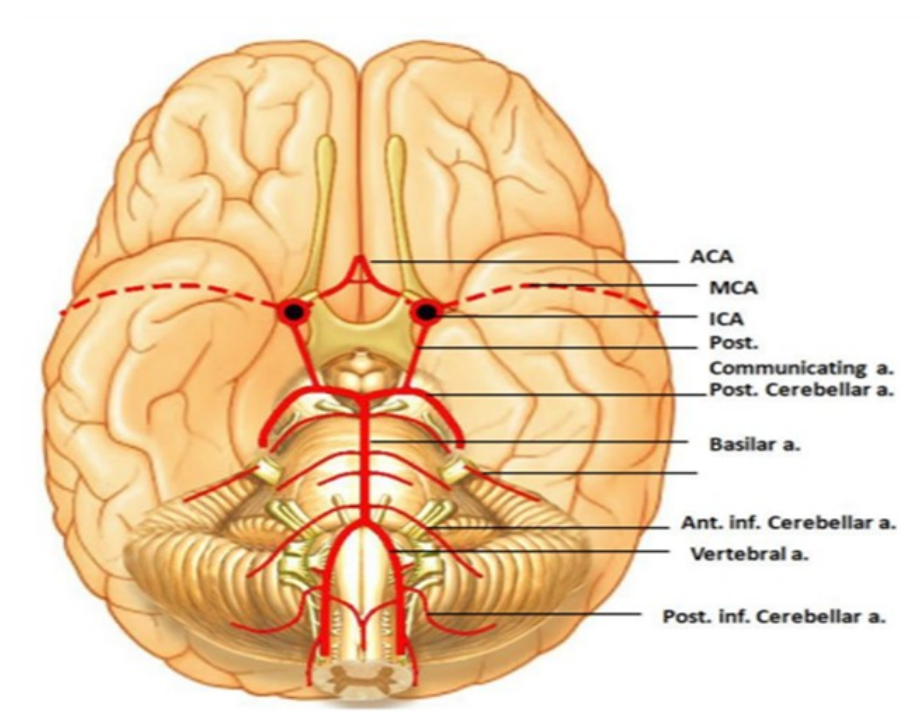
5.Medullary branches.



https://operativeneurosurgery.com/lib/exe/fetch.php?media=anterior_inferior_cerebellar_artery.png

Basilar Artery

- **Formed by union of right and left vertebral arteries at <u>lower border of pons.</u>**
- **It runs in a shallow groove along the ventral surface of pons.**
- **At the <u>upper border of pons,</u> it ends by giving its two terminal branches "right and left posterior cerebral arteries".**



Basilar artery

- **Branches of Basilar Artery (5):**

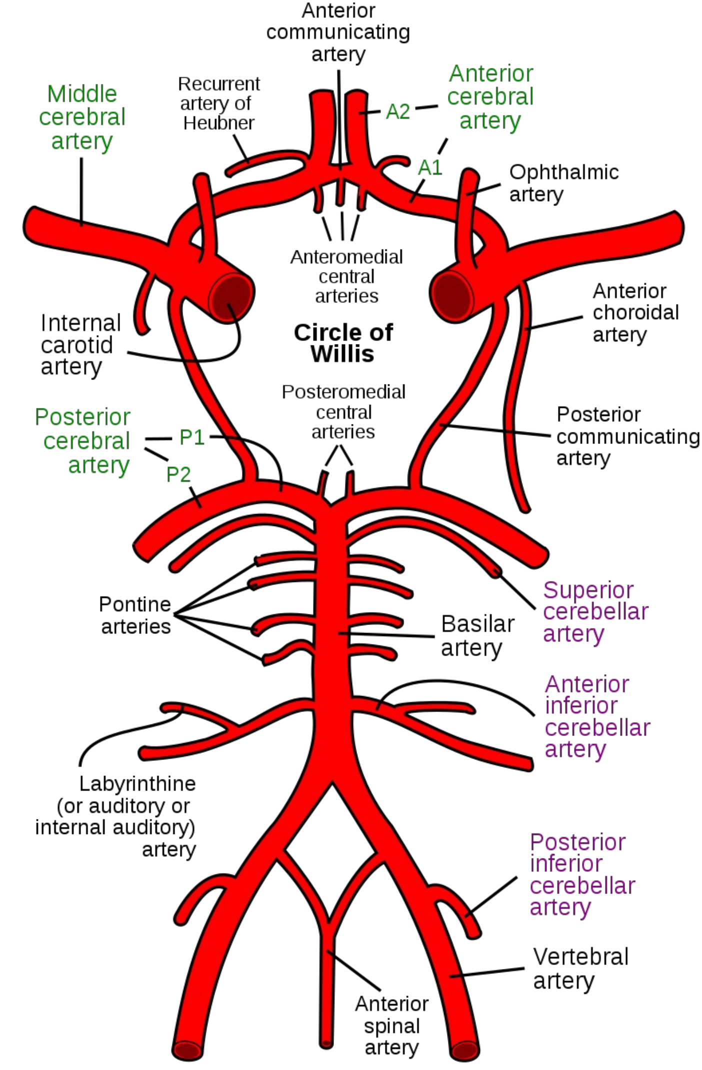
1.Pontine branches.

2.Labyrinthine.

3.Anterior inferior cerebellar.

4.Superior cerebellar.

5.Posterior cerebral.



https://upload.wikimedia.org/wikipedia/commons/thumb/2/2e/Circle_of_Willis_en.svg/800px-Circle_of_Willis_en.svg.png

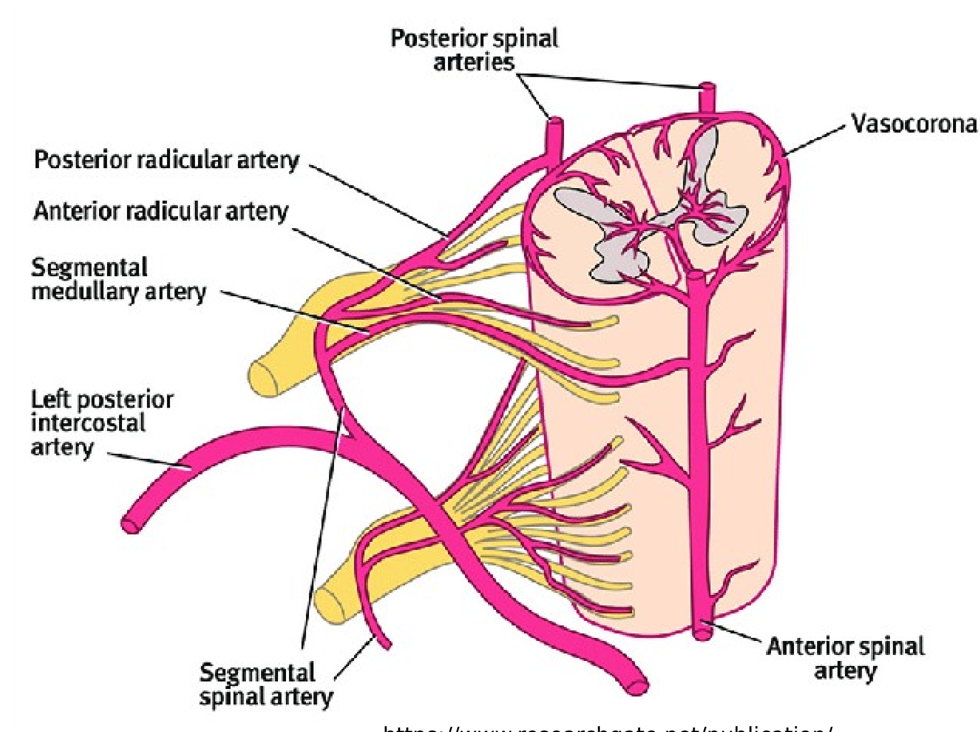

students'
activity




ANY
QUESTIONS
?

Arterial Supply of Spinal Cord

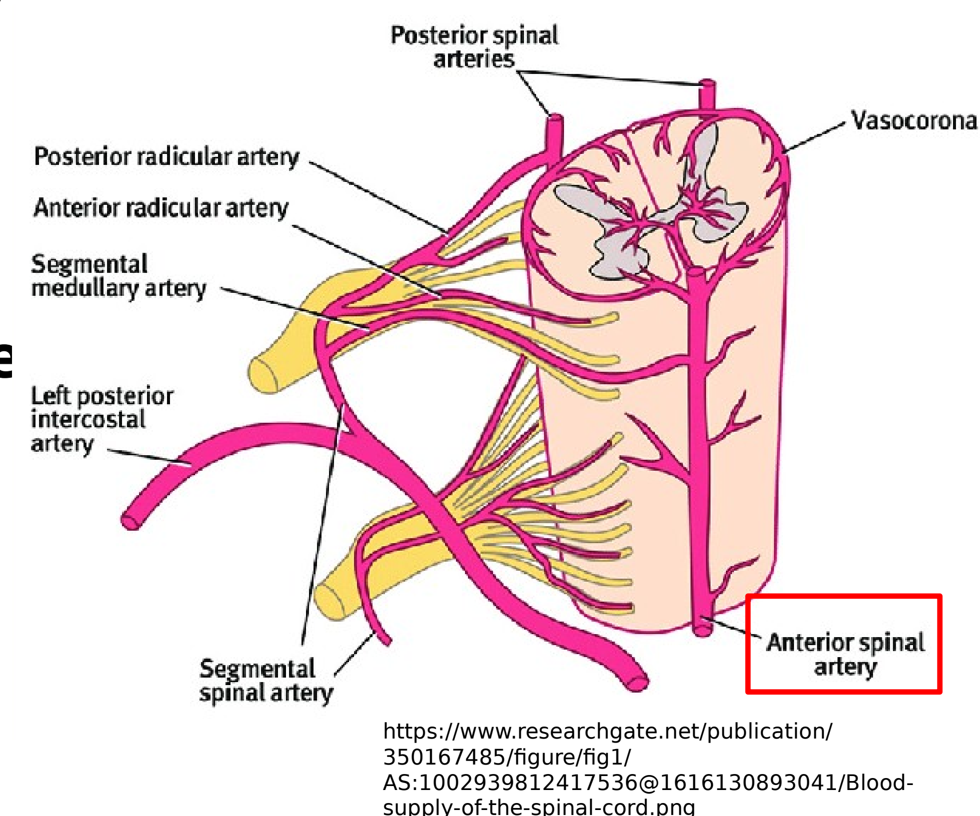
- **The spinal cord is supplied by three sets of arteries:**
  - **Two longitudinal (anterior and posterior spinal arteries)**
  - **Many segmental radicular arteries**



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Anterior Spinal Artery

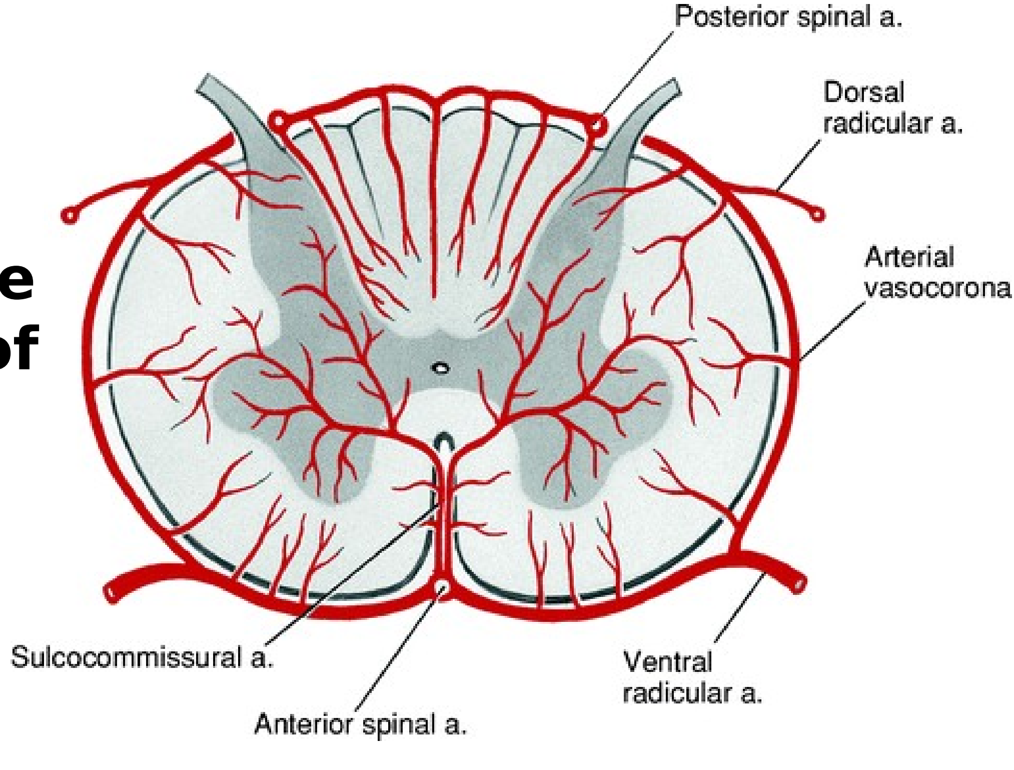
- **Origin:** **a single artery formed by union of two anterior spinal arteries, each is a branch of the vertebral artery inside the skull.**
- **Course:** **It descends through the foramen magnum then runs in the anterior median fissure of the spinal cord.**



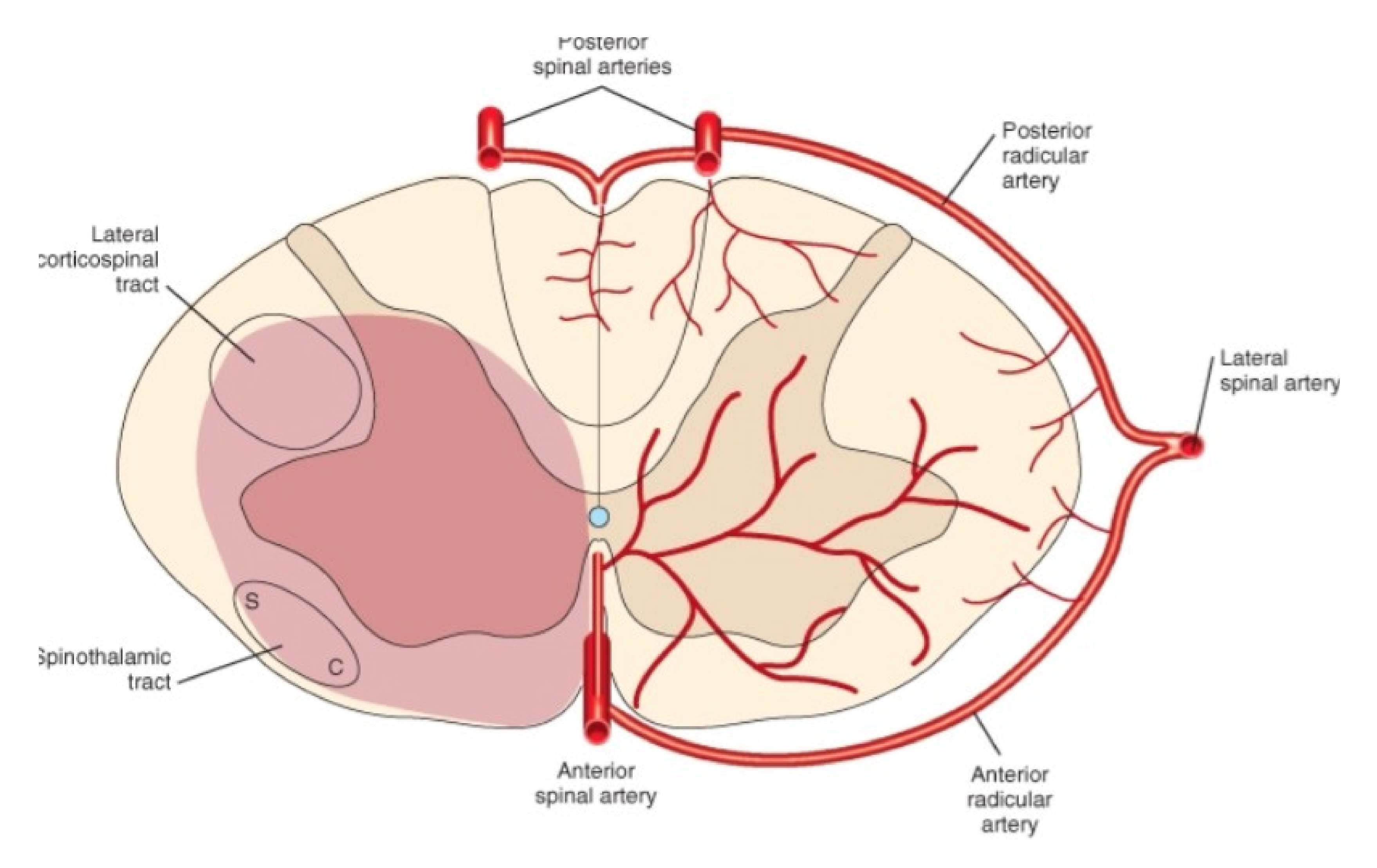
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Anterior Spinal Artery

- **Distribution: It supplies:**
- ➢ **The medial part of medulla oblongata**
- ➢ **The anterior 2/3 of the cross-sectional area of the spinal cord**
- ✓ **i.e. anterior & lateral white columns and ventral horn, lateral horn & base of dorsal horn.**



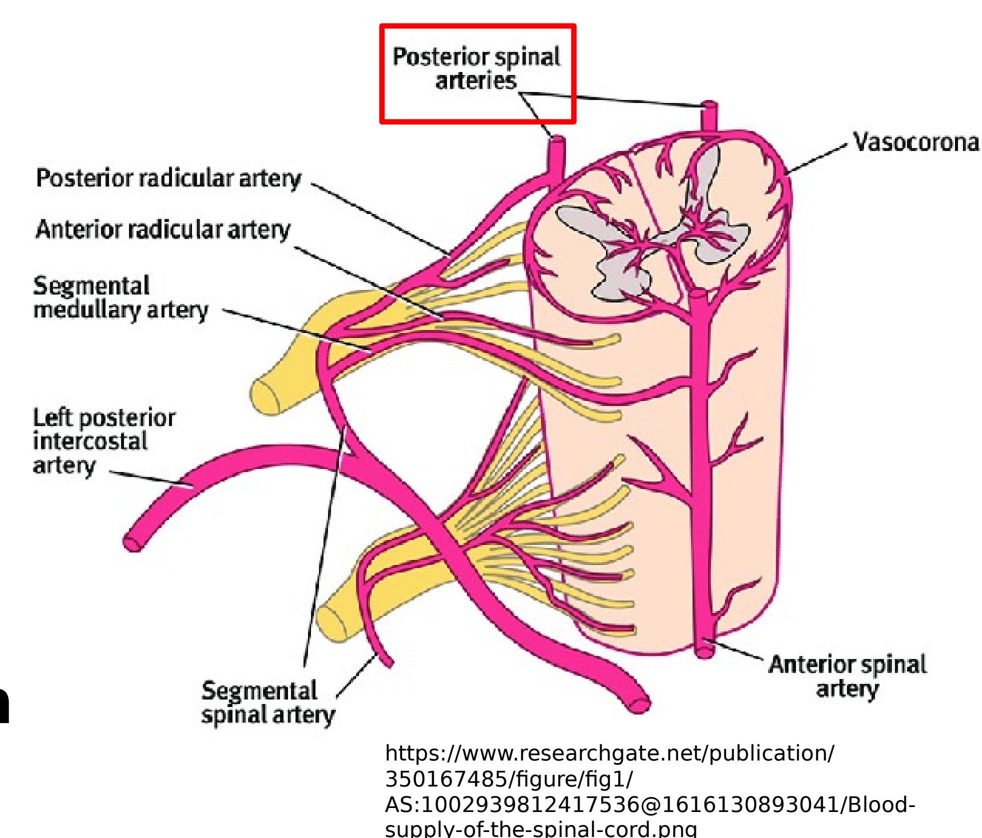
https://media.springernature.com/original/springer-static/image/chp%3A10.1007%2F978-1-61779-779-8_4/MediaObjects/978-1-61779-779-8_4_Fig6_HTML.gif



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Posterior Spinal Arteries

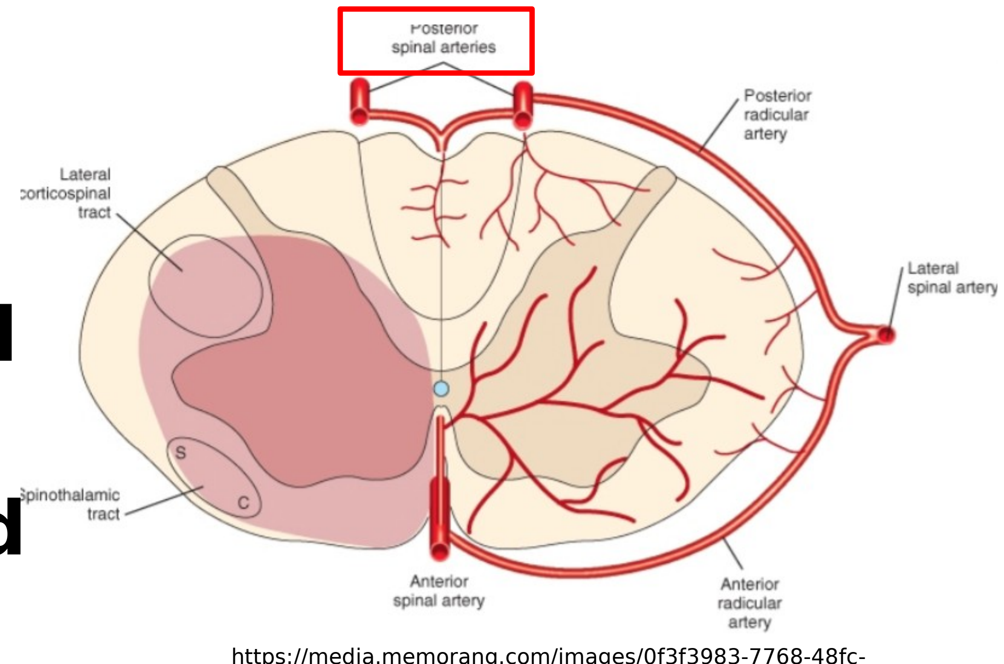
- **Origin:** **Each posterior spinal artery arises from the vertebral artery or more commonly from its posterior inferior cerebellar branch.**
- **Course:** **It descends through the foramen magnum then along the postero-lateral sulcus dividing into two branches, one descends anterior**



https://www.researchgate.net/publication/350167485/figure/fig1/AS:1002939812417536@1616130893041/Blood-supply-of-the-spinal-cord.png

Posterior Spinal Arteries

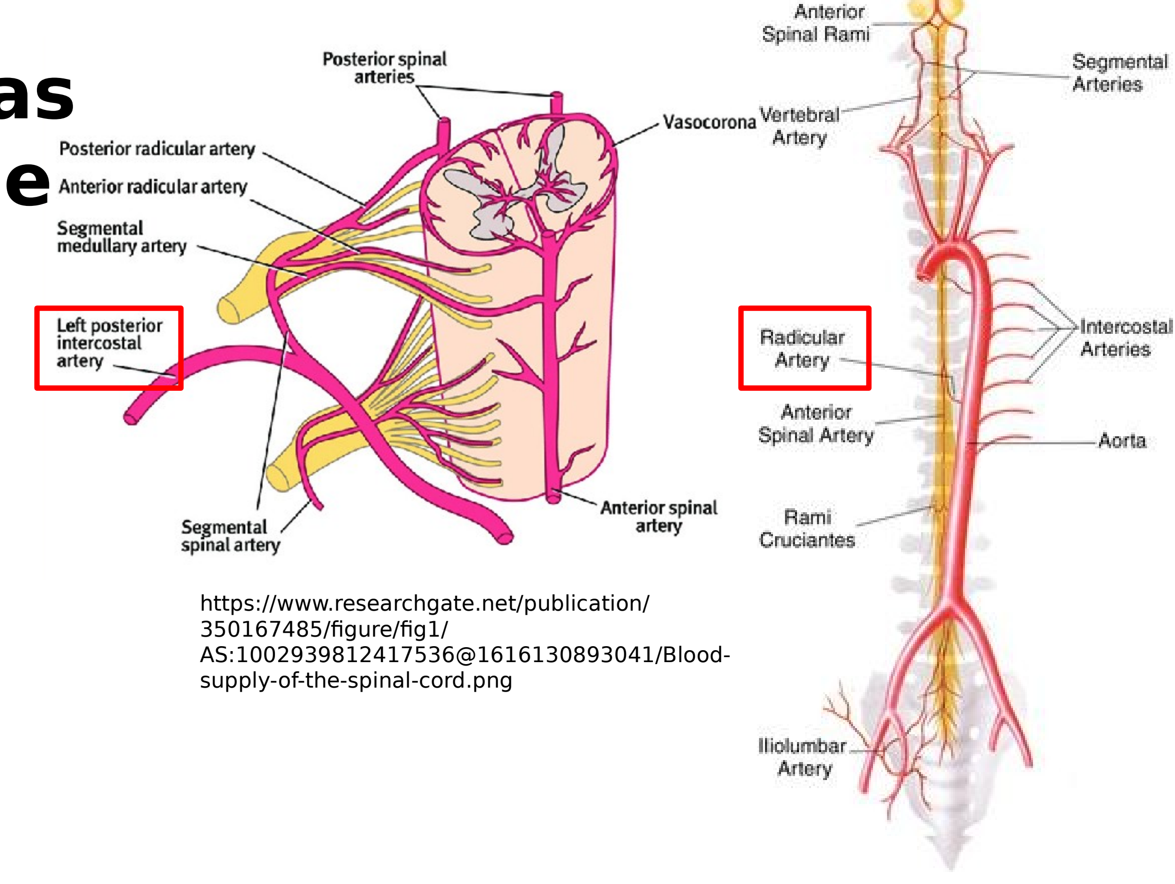
- **Distribution: It supplies:**
  - ➢ **The posterior 1/3 of the spinal cord**
  - ✓ **i.e. posterior white column and posterior horn.**



https://media.memorang.com/images/0f3f3983-7768-48fc-898c-aac878a3aacb.jpg

Segmental (Radicular) Arteries

- **Origin:** arise as **twigs** from the following arteries:
- Vertebral
- Ascending cervical
- Posterior intercostal
- 1st lumbar artery

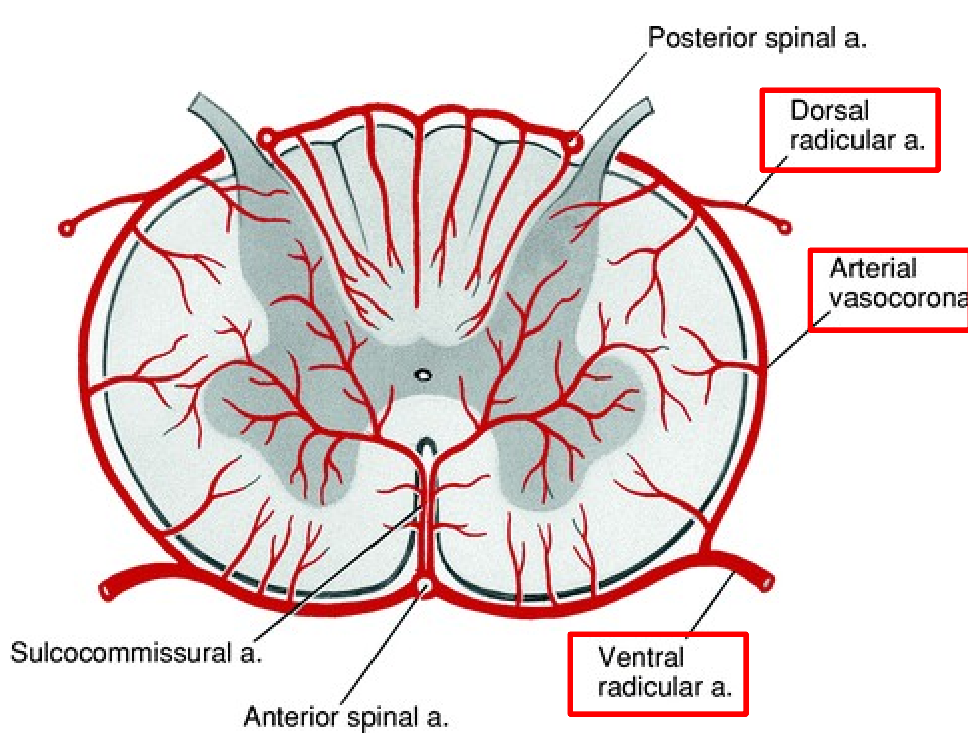


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https://upload.orthobullets.com/topic/2004/images/artery%20of%20adamkiewicz.jpg

Segmental (Radicular) Arteries

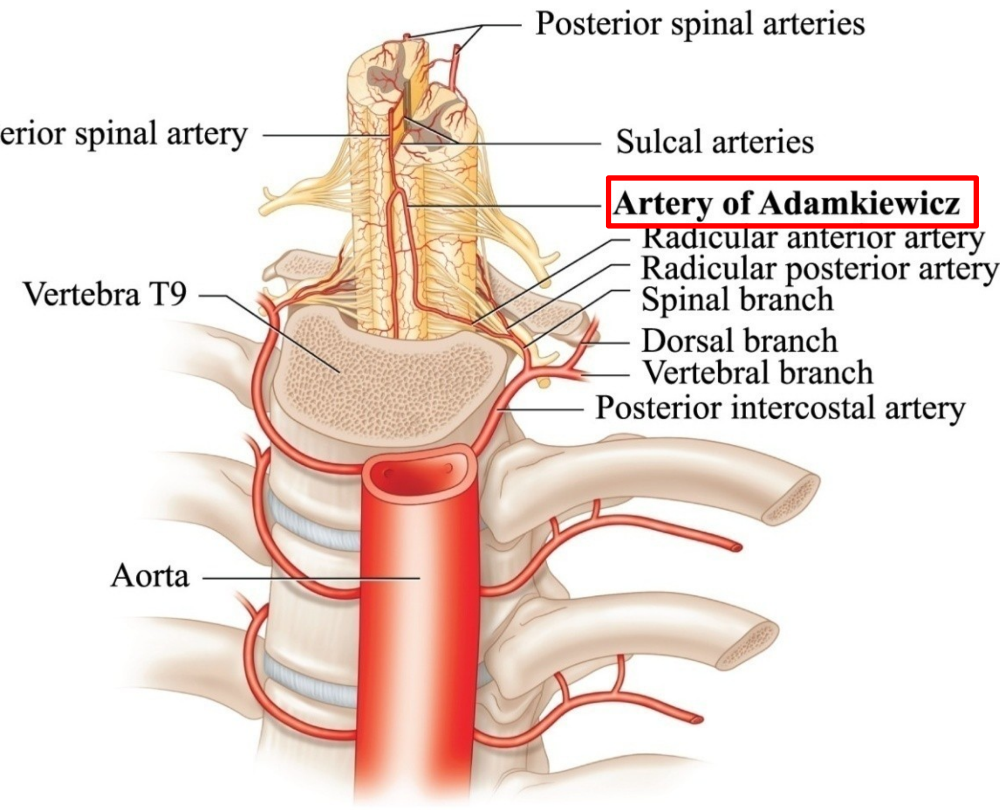
- **Course:**
  - **They enter the vertebral canal through the intervertebral foramina.**
  - **They give anterior and posterior radicular branches that pass along the ventral & dorsal roots to reach the surface of the spinal cord & form an arterial circle of anastomosis with the branches of anterior & posterior spinal arteries**



https://media.springernature.com/original/springer-static/image/chp%3A10.1007%2F978-1-61779-779-8_4/MediaObjects/978-1-61779-779-8_4_Fig6_HTML.gif

Segmental (Radicular) Arteries

- **Some radicular arteries may be large and are called feeder arteries.**
- **One of the feeder arteries is called artery of Adamkiewicz which arises from 11th intercostal artery and may be the main supply to the lower two-thirds of the cord.**

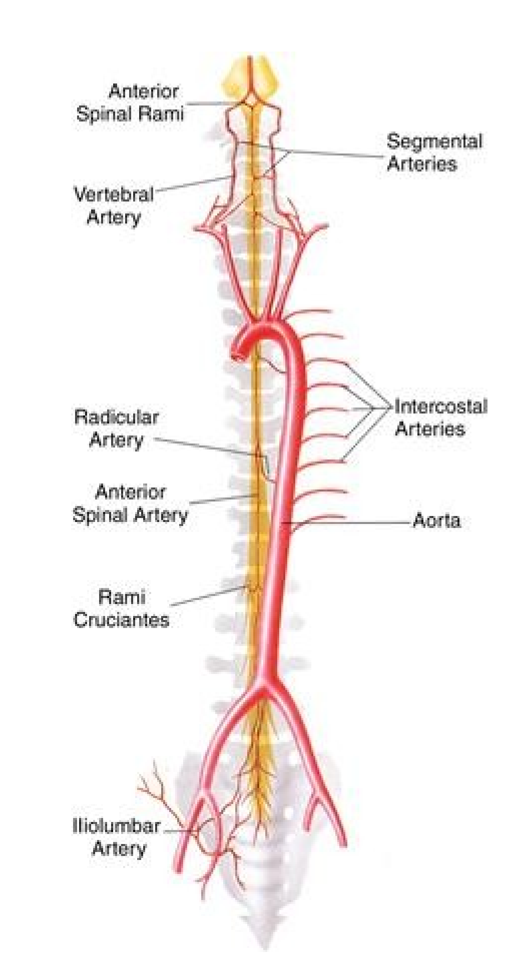


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Arterial Supply of Spinal Cord

❑**Note:**

- **Once an artery enters the substance of the spinal cord, it is an end artery .i.e once obstructed, infarction of the area supplied by them occurs.**
- **The cervical part of the spinal cord depends more on anterior & posterior spinal arteries, while lower segments depend more on the radicular arteries.**
- **The mid-thoracic segments of the cord are the most liable to become ischemic.**
- **The richest blood supply is to the lumbar region.**

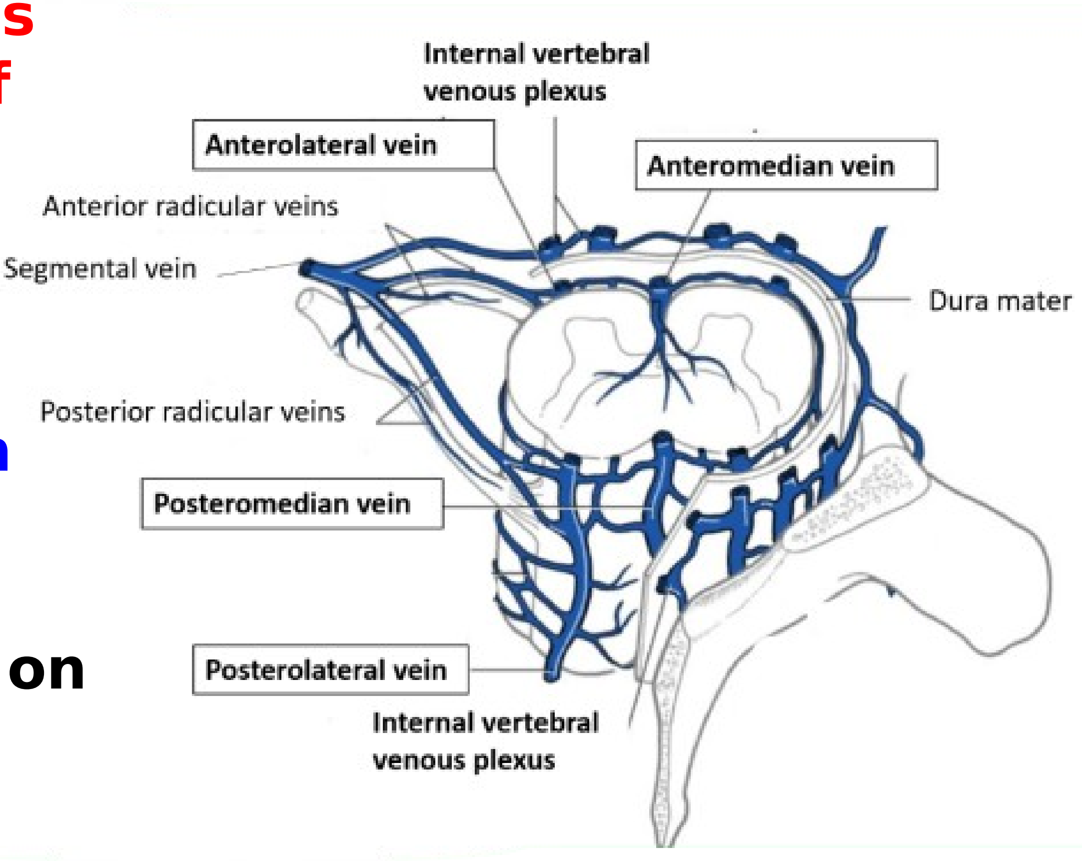


https://upload.orthobullets.com/topic/2004/images/artery%20of%20adamkiewicz.jpg

Venous Drainage of Spinal Cord

- **Six longitudinal veins ascend on surface of spinal cord:**

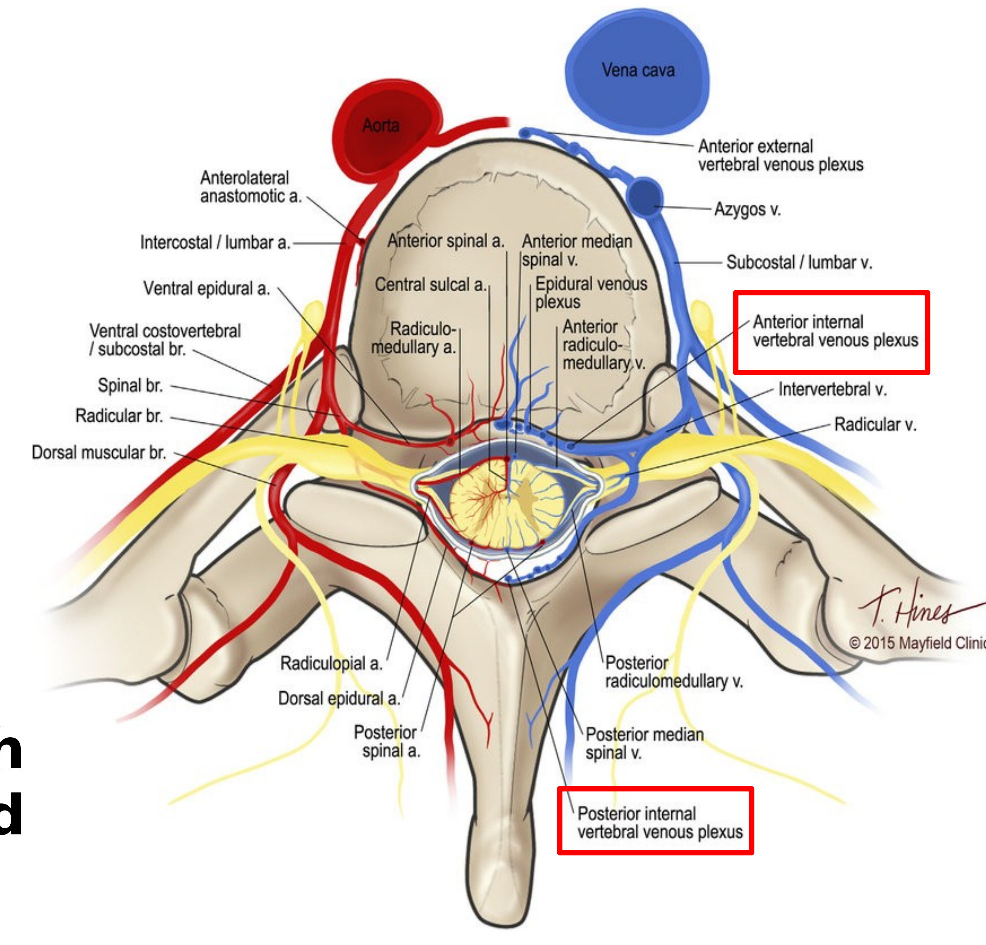
1. **Anteromedian vein along the <u>anterior median fissure.</u>**
2. **Posteromedian vein along the <u>posterior median sulcus.</u>**
3. **Four veins that run on either side of the <u>ventral and dorsal roots.</u>**



https://i1.wp.com/anatomyqa.com/wp-content/uploads/2017/07/word-image-39.png?resize=604%2C376

Venous Drainage of Spinal Cord

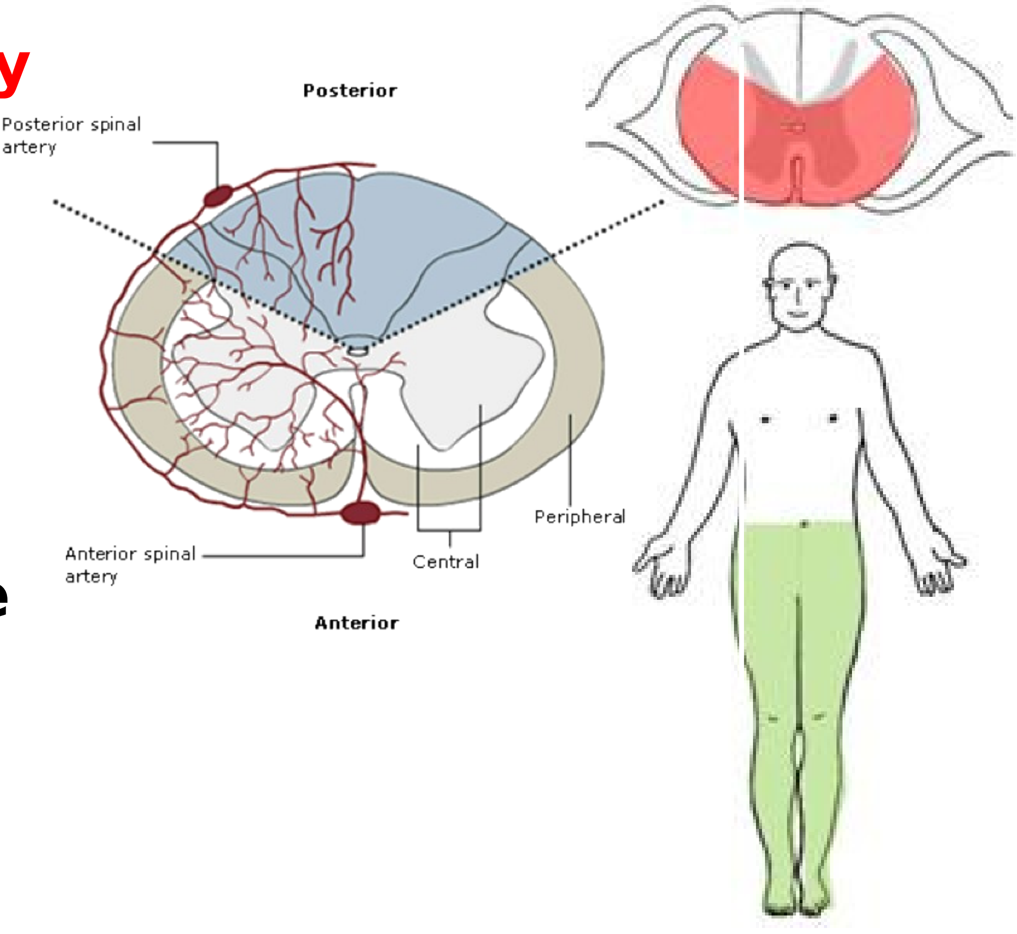
- These veins communicate freely with each other.
- They drain into the internal vertebral venous plexus and communicate with the intervertebral veins.
- Near the base of the skull, the longitudinal veins communicate with the cerebellar veins and cranial venous sinuses.



https://www.researchgate.net/profile/Shawn-Vuong-2/publication/302476739/figure/fig1/AS:700162850697216@1543943240024/Anatomical-illustration-of-a-typical-thoracic-spine-level-showing-the-arterial-and-venous_Q640.jpg

Anterior Spinal Artery Occlusion

- **Anterior Spinal artery occlusion leads to:**
  - **Bilateral UMNL paralysis below the lesion.**
  - **Bilateral loss of pain and temperature sensations below the lesion with preservation of proprioception and touch.**



https://www.learnsurgeryonline.com/wp-content/uploads/2020/06/vascular-suppy1.png

Lecture Quiz

- **During repair of an aortic aneurysm, a patient awakes with neurological signs, which the neurologist attributed to temporary occlusion of the feeder arteries to the anterior spinal artery. Which of the following neurological signs would be least likely to observe in the patient?**

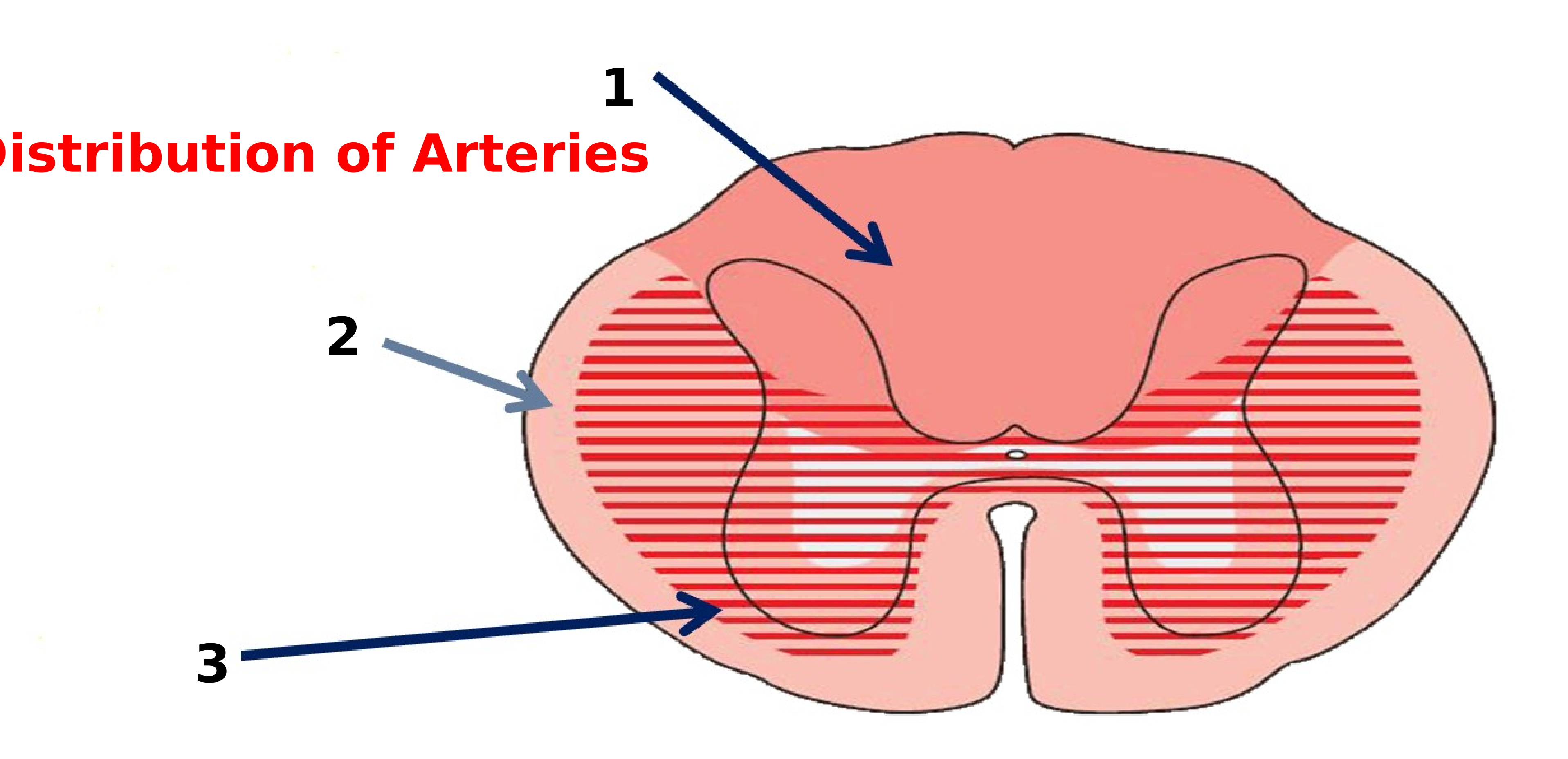
a. **Bilateral loss of pain and temperature below the site of occlusion.**
b. **Bilateral weakness below the site of occlusion.**
c. **Bilateral loss of vibratory sense below the site of occlusion.**
d. **Bilateral Babinski sign.**

Lecture Quiz answer

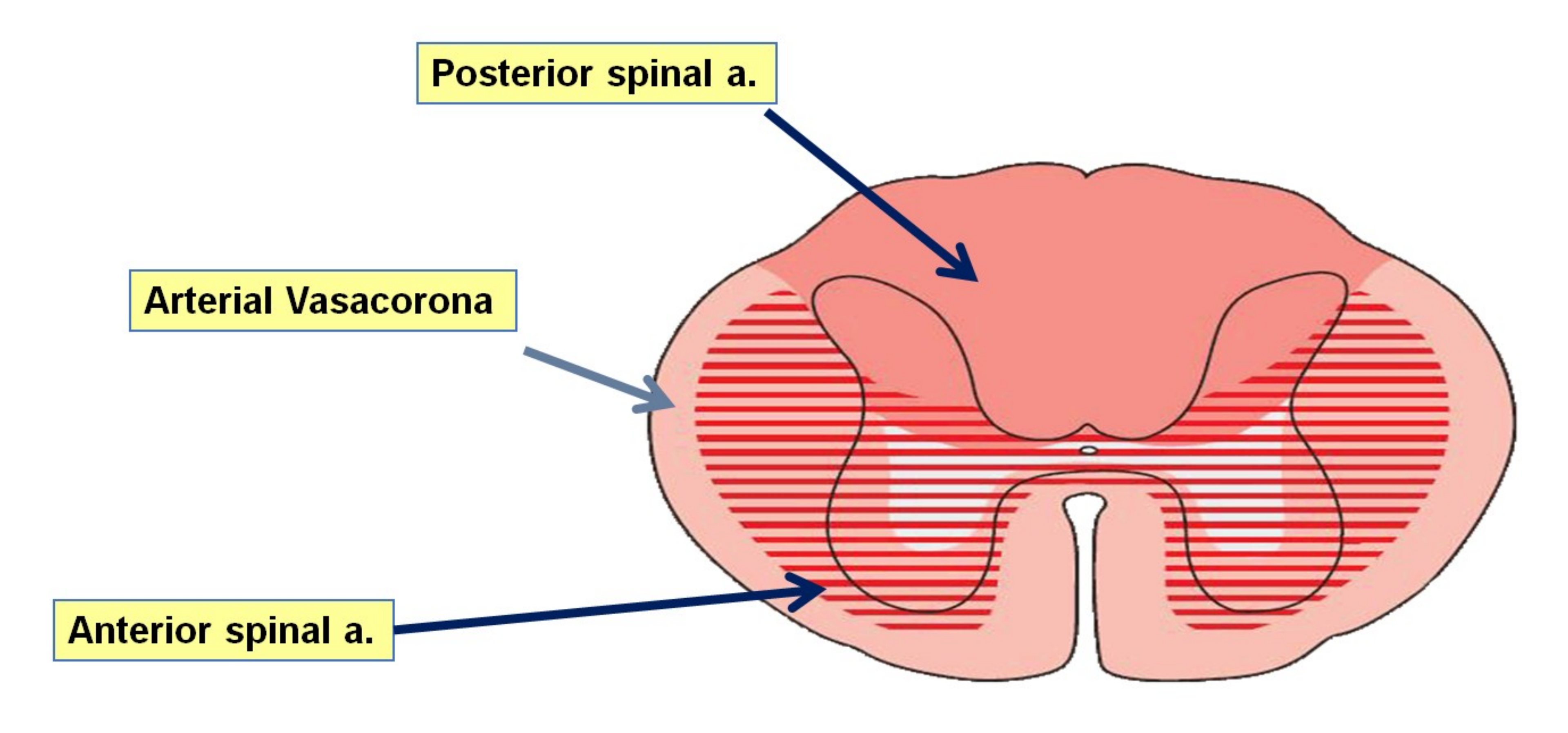
- **During repair of an aortic aneurysm, a patient awakes with neurological signs, which the neurologist attributed to temporary occlusion of the feeder arteries to the anterior spinal artery. Which of the following neurological signs would be least likely to observe in the patient?**

a. **Bilateral loss of pain and temperature below the site of occlusion.**
b. **Bilateral weakness below the site of occlusion.**
c. **Bilateral loss of vibratory sense below the site of occlusion.**
d. **Bilateral Babinski sign.**

Lecture Quiz



Lecture Quiz answer



Lecture Summary



1. **The vertebral artery:**

- **beginning, termination, parts, branches and distribution.**

2. **The basilar artery:**

- **beginning, termination, parts, branches and distribution.**

3. **The various sources of the arterial supply of the spinal cord:**

- **origin, distribution and effect of obstruction.**

Suggested Textbooks

1. Clinically Oriented Anatomy 5th edition P. 528

Thank You